

What Is Claimed Is:

1. An injection catheter comprising:
an elongated shaft having a distal end and a proximal end and a first lumen extending therebetween;
a needle with a proximal end and a distal end and a needle lumen extending therebetween, the needle disposed within the first lumen of the elongated shaft and extending from a proximal end of the catheter to a distal end of the catheter; and
a needle depth control device located at the distal end of the catheter for controlling a variable extent to which the needle may be extended beyond the distal end of the elongated shaft.
2. The injection catheter of claim 1 wherein the needle depth control device comprises:
a stop collar near the distal end of the needle, wherein the position of the stop collar with respect to the needle is adjustable.
3. The injection catheter of claim 2 further comprising:
a first set of threads located on the needle;
a second set of threads located on the stop collar; and
means for preventing rotation of the stop collar with respect to the elongated shaft while permitting longitudinal movement of the stop collar on the elongated shaft;
wherein the first set of threads is engaged with the second set of threads such that rotation of the needle causes the stop collar to move longitudinally with respect to the needle to adjust the position of the stop collar with respect to the needle.
4. The injection catheter of claim 3, wherein the means for preventing rotation of the stop collar with respect to the elongated shaft while permitting longitudinal movement of the stop collar on the elongated shaft comprises:
a plurality of outwardly extending longitudinal protrusions located on the stop collar; and
a plurality of grooves in an inner surface of the elongated shaft to slidably receive the plurality of outwardly extending longitudinal protrusions.

5. The injection catheter of claim 1 wherein the needle depth control device comprises:

a stop collar near the distal end of the needle; and

a spring mechanism disposed on the outer surface of the needle and inside the elongated shaft, the spring having a proximal end and a distal end, and the proximal end of the spring adapted to contact a distal side of the stop collar;

wherein the extent to which the needle may be extended beyond the distal end of the elongated shaft is controlled by controlling the amount of longitudinal force applied to the needle, which causes the spring to compress a certain amount to permit extension of the needle.

6. The injection catheter of claim 2 wherein the needle depth control device comprises:

a plurality of push rods, each having a proximal end and a distal end, wherein each of the plurality of push rods has a different length, wherein each of the plurality of push rods is disposed inside the elongated shaft, and wherein the distal end of each of the plurality of push rods is adapted to push against a flange attached to the needle to advance the needle;

wherein the extent to which the needle may be extended beyond the distal end of the elongated shaft is controlled by selecting which of the plurality of push rods to advance.

7. The injection catheter of claim 2 wherein the needle depth control device comprises:

a needle stop collar attached to the needle and having a distal end having a plurality of distal extensions around its circumference;

wherein the extent to which the needle may be extended beyond the distal end of the elongated shaft is controlled by rotating the needle stop collar.

8. The injection catheter of claim 7 wherein the distal end of the needle stop collar has a stair-step configuration.

9. The injection catheter of claim 7 wherein the needle depth control device further comprises:

a hood attached to the elongated shaft and having a proximal end having a plurality of proximal extensions;

wherein the extent to which the needle may be extended beyond the distal end of the elongated shaft is controlled by rotating the needle stop collar such that one or more of the distal extensions of the needle stop collar is selected to be longitudinally aligned with one or more of the proximal extensions of the hood.

10. The injection catheter of claim 9 wherein the proximal end of the hood has a stair-step configuration.

11. The injection catheter of claim 1 further comprising a mandrel extending from the proximal end to the distal end of the catheter for advancing the needle.

12. An injection catheter comprising:

a first elongated shaft having a distal end and a proximal end and a first lumen extending therebetween;

a second elongated shaft having a distal end and a proximal end and a second lumen extending therebetween, the second elongated shaft disposed within the first lumen of the first elongated shaft and extending from a proximal end of the catheter to a distal end of the catheter;

wherein an outer diameter of the second elongated shaft is approximately equal to an inner diameter of the first elongated shaft.

13. The injection catheter of claim 12 wherein the outer surface of the second elongated shaft and the inner surface of the first elongated shaft are made of a low friction material.

14. The injection catheter of claim 13 wherein the low friction material comprises polytetrafluoroethylene.

15. The injection catheter of claim 12 wherein the outer surface of the second elongated shaft and the inner surface of the first elongated shaft are coated with a low friction material.

16. The injection catheter of claim 12 wherein the second elongated shaft comprises a non-absorbing material.

17. The medical device of claim 12 wherein the first elongated shaft is reinforced with a braid.

18. A injection catheter comprising:

a first elongated shaft having a distal end and a proximal end and a lumen extending therebetween;

a second elongated shaft slidingly disposed in the first elongated shaft, the second elongated shaft having a distal end and a proximal end and a lumen extending therebetween; and

a third elongated shaft disposed in and attached to the second elongated shaft, the third elongated shaft to move in a one-to-one relationship with the first elongated shaft and the third elongated shaft to control the length of the second elongated shaft to maintain a predetermined deployment length of the distal end of the second elongated shaft as each are subjected to various bend configurations.

19. The injection catheter of claim 18 further comprising:

a needle depth control device at the proximal end of the injection catheter.

20. The injection catheter of claim 18 wherein the second elongated shaft comprises:
an expansion resistant material.